SERVICE MANUAL

Chairman Playman/Robo

permobil

US

How to contact Permobil

Permobil Inc. USA
6961 Eastgate Blvd.
Lebanon, TN 37090
USA
Phone: 800-736-0925
Fax: 800-231-3256
Email: info@permobilusa.com

Head Office of the Permobil group
Permobil AB
Box 120, 861 23 Timrå, Sweden
Tel: +46 60 59 59 00. Fax: +46 60 57 52 50
E-mail: info@permobil.se

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Introduction

The Service Manual is intended for technical personnel who maintain and repair electric wheelchairs. It is important that anyone who performs maintenance and repairs described in this manual reads and understands the content of this manual so that the work is performed professionally. Always state the serial number when contacting Permobil to ensure that the correct information is provided.

Technical Support

In the event of technical problems, you should contact your dealer, or Permobil Inc. USA at 800-736-0925.

Spare parts

Spare parts must be ordered through your dealer.

Warranties

Contact your dealer or Permobil Inc. USA for information about the warranties for this chair.

Maintenance

See the information in the Owner's Manual.

Identification Plates

Chassis

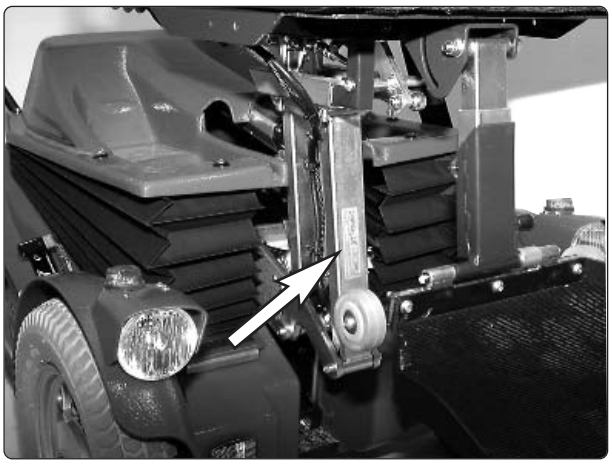


Fig. 1. Chassis identification number

Pilot+ Power Module

Fig. 2. Pilot+ output stage identification number.

Control panel

Fig. 3. Control panel identification number.

Seat lift release

If the seat lift cannot provide elevation in a normal manner due to discharged batteries or a broken actuator, the seat can instead be lifted forward manually.

1. Remove the plug located on the left side of the cover, see fig. 4.

Fig. 4. Seat lift release.

2. Unscrew the actuator until it is loose using a long allen key (10mm), see Fig. 5.

Fig. 6 shows the actuator's base with the cover removed.

NOTE! Block the seat up in front before loosening the screw. The seat is heavy and can fall forwards.

3. Carefully lower the seat forwards.

NOTE! Make sure that the wiring is not stretched too tightly.

4. Detach the seat lift cover, see page 8.

5. Remount the actuator.

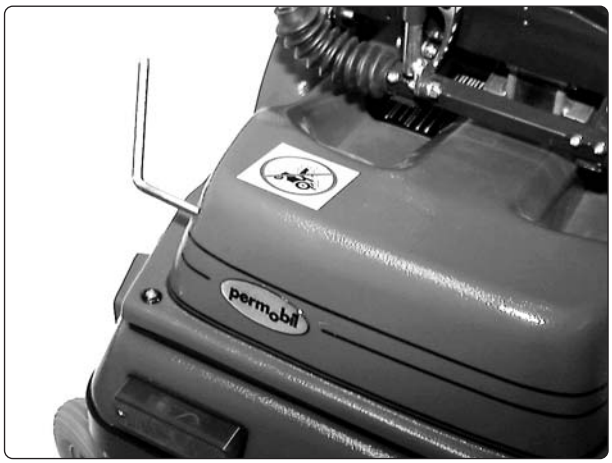


Fig. 5. Seat lift release.

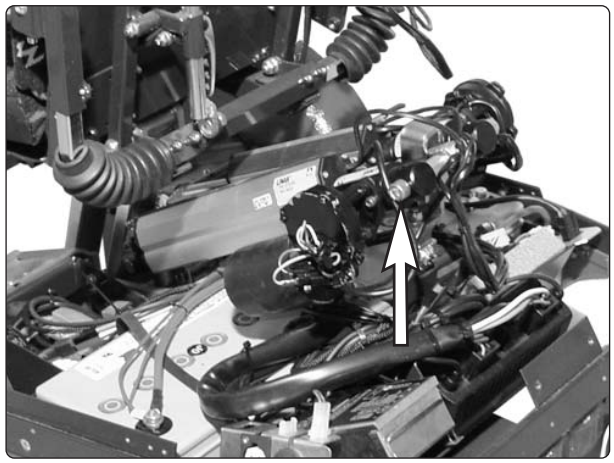


Fig. 6. Seat lift release.

Covers

Removal

1. Run the seat up to its uppermost position. To manually raise the seat, see page 7.
2. Remove the seat lift cover by lifting it straight up. It is mounted with hooked pile fabric belts.

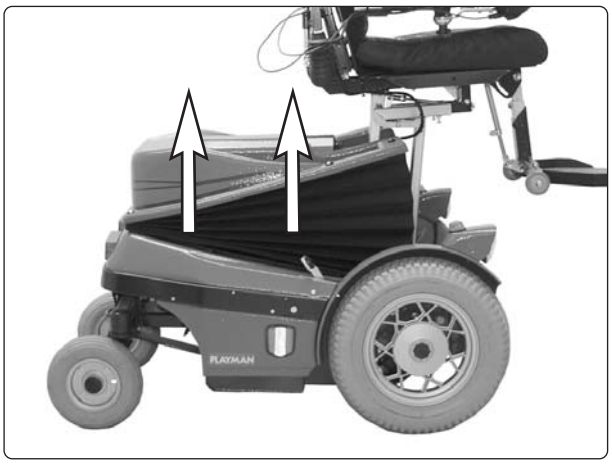


Fig. 7. The seat lift cover can be lifted straight up.

3. Then loosen the chassis cover, which is mounted using four screws. See fig. 8.

NOTE! Be careful when removing the chassis cover. A chassis equipped with lights has the wiring for its rear lights fastened to the electronics. Separate the wiring for the rear lights at the contact located on the wiring.

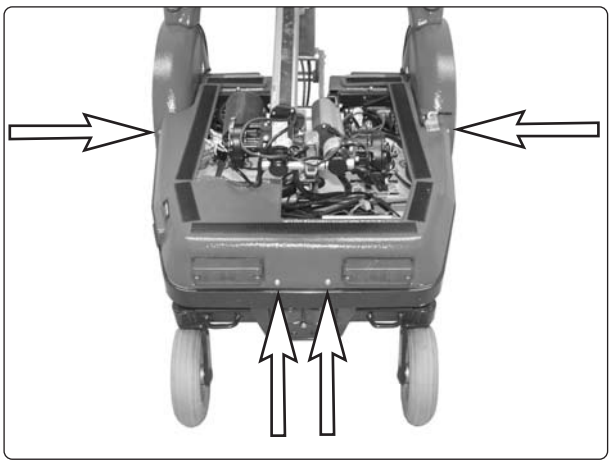


Fig. 8. The chassis cover is mounted using four screws.

4. Remove the two front covers. Each is mounted with two screws, see fig. 9.

Fitting

Mounting is performed in the reverse order.

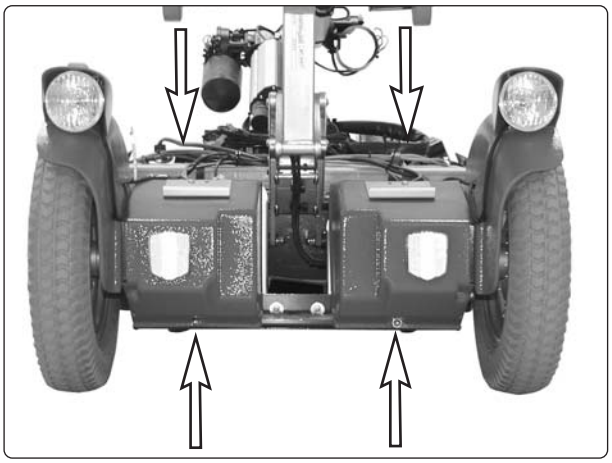


Fig. 9. Each of the front covers is mounted using two screws.

Batteries

NOTE! Wear safety goggles when working with batteries.

Removal

1. Detach the seat lift cover and chassis cover, see page 8.

NOTE! Be careful when removing the chassis cover. A chassis equipped with lights has the wiring for its rear lights fastened to the electronics. Separate the wiring for the rear lights at the contact located on the wiring.

2. Switch off the power using the control panel.
3. Set the main fuse to the “OFF” position, see fig. 10.
4. Block the front edge of the seat up, loosen the seat lift’s base by loosening the lock nut, see fig. 11. Take note of the design of the base with an eye towards the future remounting. Carefully lower the seat forward.
5. Loosen the battery connections. The positive terminals first, and thereafter the negative terminals.
6. In order to gain access to the battery more easily, the electrical connections for the drive motor, magnetic brake, lights and brake release sensor can be loosened. Note the placement of the cables with an eye towards future remounting.
7. Lift the batteries out.

Install

1. Seat your two new batteries. The battery terminals must be located towards the rear.
2. Mount the battery connections, first the negative terminals and thereafter the positive terminals.
3. Mount the electrical connections for the drive motor, magnetic brake, lights and brake release sensor if they have been disconnected earlier.
4. Carefully elevate the seat upwards again, mount the base and retighten the lock nut.
5. Mount the covers again.
6. Switch the main fuse to the “ON” position, see fig. 10.

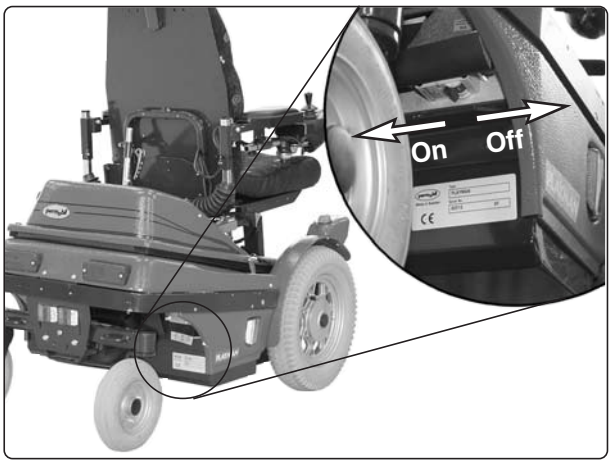


Fig. 10. Main fuse/Battery isolator.

Fig. 11. Seat lift lock nut.

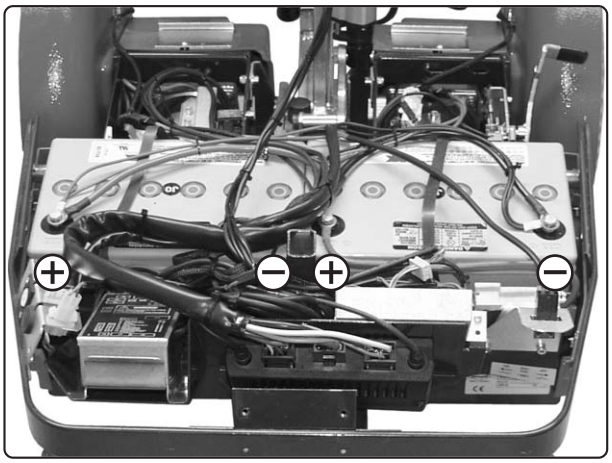


Fig. 12. Battery connections.

Drive wheels

Removal

1. Switch off the main switch.
2. Lift up the chair and support it on blocks, so that the wheels are off the ground.
3. Undo and remove the hubcap (5), bolt (4) and washers (2 and 3), see fig. 14.
4. Pull the wheel off the shaft. Use puller 304103-99-0 if the wheel is tight, see fig. 13.

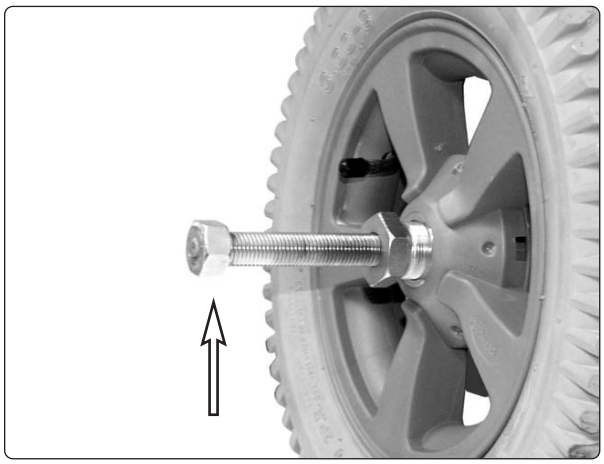


Fig. 13 Puller 304103-99-0.

Fitting

1. Check the axle and rim for any damage. If necessary, you should clean these parts of dirt and rust. If any parts are damaged, they should be replaced.
2. Check that the key fits solidly in the keyway of the axle. If necessary, install the new key and check for fit.
3. Lubricate the shaft with a thin layer of copper paste (Würth 0893800x, Art. no.: 1820540).

WARNING !

Warning! *Do not use any type of lubrication in the threaded hole in the axle or on the bolt. If necessary, you should clean these parts.*

4. Fit the wheel onto the axle. The use of hand force only is preferred, but, if need be, carefully use a rubber mallet, whose head diameter is no less than 1.5 inches (38 mm), to ensure that the rim is fully seated upon the motor.

NB! Hitting too hard with a rubber mallet could cause damage to the gear.

5. Put the washers (2 and 3) onto the bolt (4) and tighten the wheel, see fig. 14.

   Use a torque wrench to tighten the bolt to 18 ft-lbs. Install the hub cap (6), see Fig. 14.

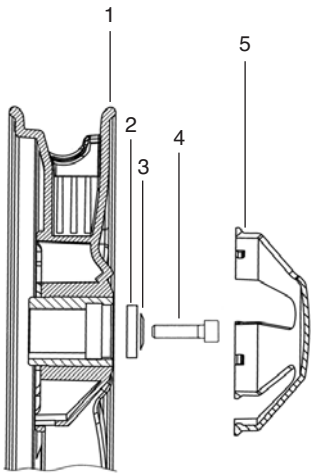
NB! The bolt must be used once only. Removed bolt is not allowed to be refitted.

WARNING !

Warning! *Other types of bolts or washers are not to be used..*

WARNING !

Warning! *Do not use any other type of thread lock.*



1. Front wheel
2. Washer, TBRSB 8.4x26x5
3. Washer, Nordlock M8x16.6, glued.
4. Bolt, Eslock MC6S M8x35
5. Hubcap

Fig. 14. Wheel attachment.

Brake release cables

The upper cable controls the right brake unit and the lower cable controls the left brake unit.

Removal

1. Raise the seat lift to its highest position, see page 7.
2. Remove the battery and seat lift covers, see page 8.
3. Loosen the locknut, see fig. 15:2.
4. Screw the adjusting screw fully in, see fig. 15:1.
5. Detach the cable at the magnetic brake and brake release mechanism.

Fitting

1. Attach the cable to the magnetic brake, then to the release lever.
2. Adjust the length of the cable sleeve using the adjusting screw (15:1), so that the cable is tensioned but does not pull the release link.
3. Check the operation. Operate the release lever to release the brake and check that the wheel can turn.
4. Tighten the locknut (15:2).
5. Refit the covers.

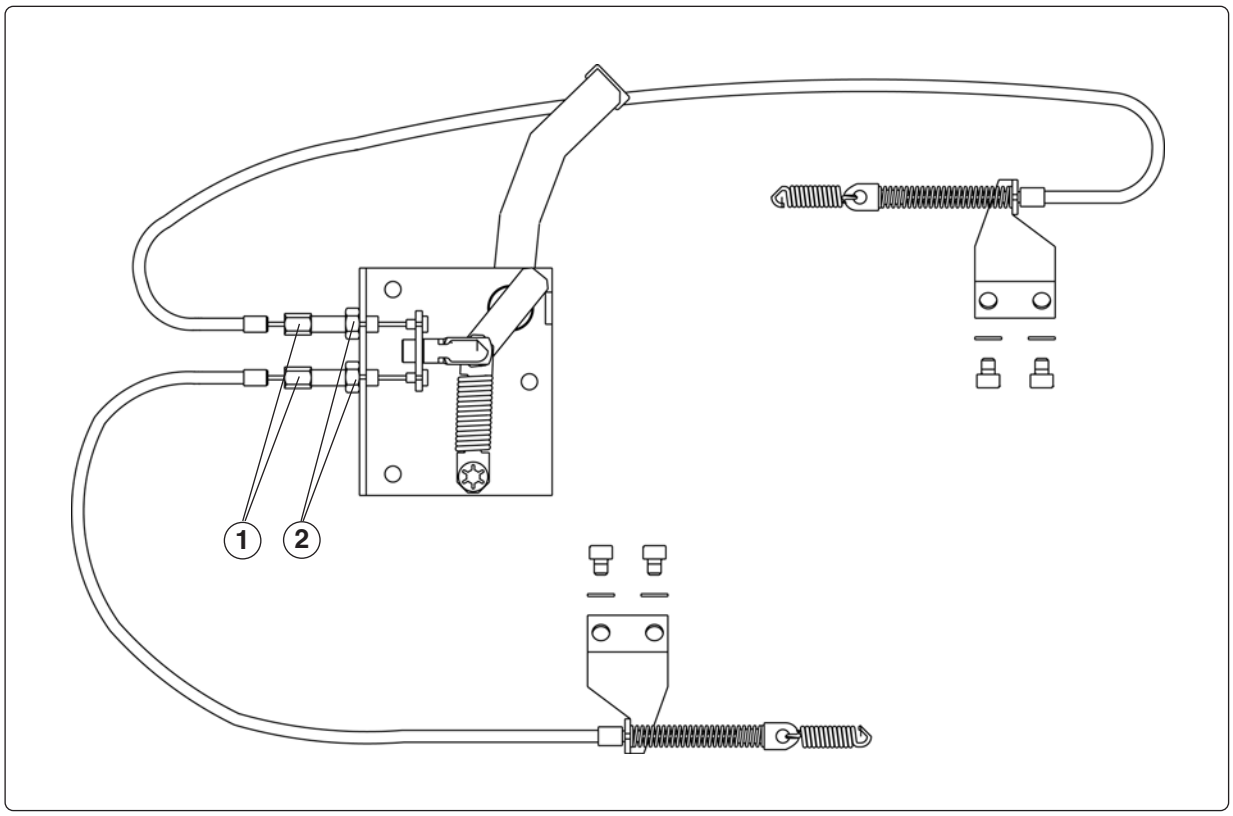


Fig. 15. Brake release mechanism.

Magnetic brakes

Removal

1. Raise the seat lift to its highest position, see page 7.
2. Switch off the power using the control panel.
3. Put the circuit breaker in the “OFF” position, see page 20.
4. Remove the battery cover and rear cover, see page 8.
5. Remove the battery from the side you are working on, see page 9, to facilitate removal of the magnetic brake.
6. Disconnect the electrical connector from the magnetic brake, see fig. 16.

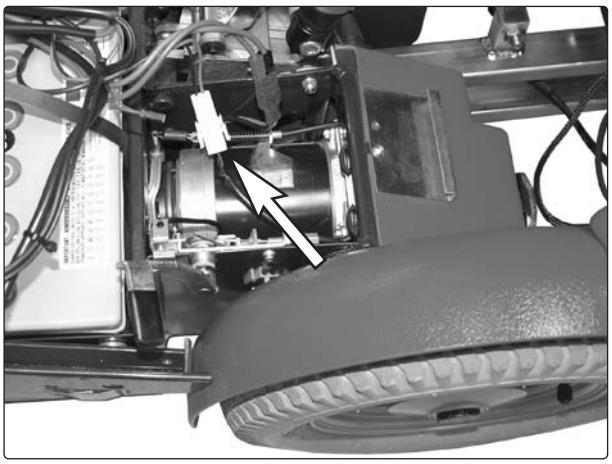


Fig. 16. Magnetic brake electrical connection.

7. Pull the cable sleeve forwards and take the cable out through the slot in the cable mounting. Unhook the brake release cable from the magnetic brake, see fig. 17.

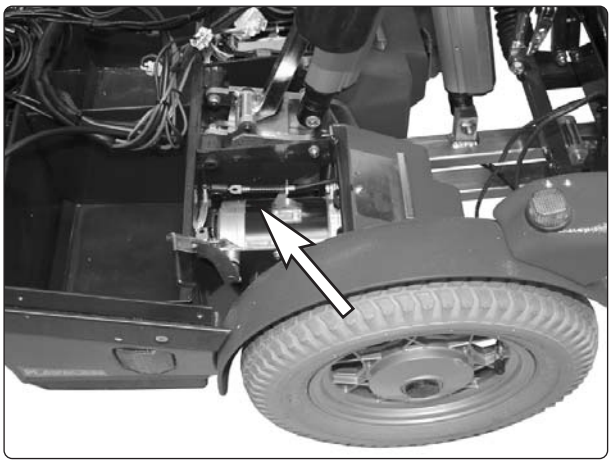


Fig. 17. Magnetic brake release cable.

8. Unscrew the three screws that hold the brake, see fig. 19. Note the position of the brake release arm for refitting. Remove the brake, complete with the disc and cover.

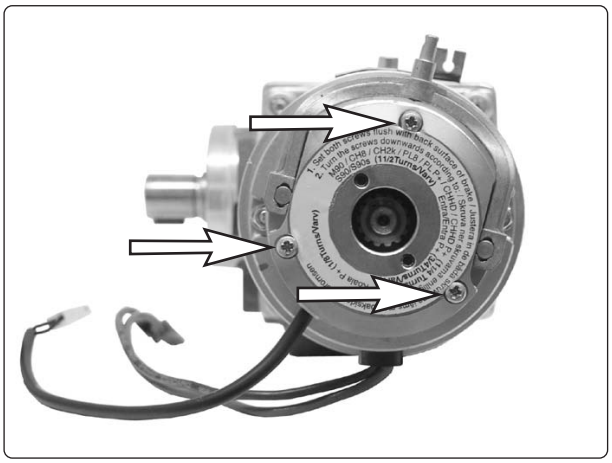


Fig. 18. Magnetic brake fixing bolts.

Fitting

1. Use the adjusting screws to adjust the magnetic brake. Set both screws flush with back surface of the brake, then turn the screws downwards 1 1/4 turns, see fig. 18.

Fig. 19. Adjusting the magnetic brake using the two adjusting screws.

2. Fit the brake disc into the magnetic brake.

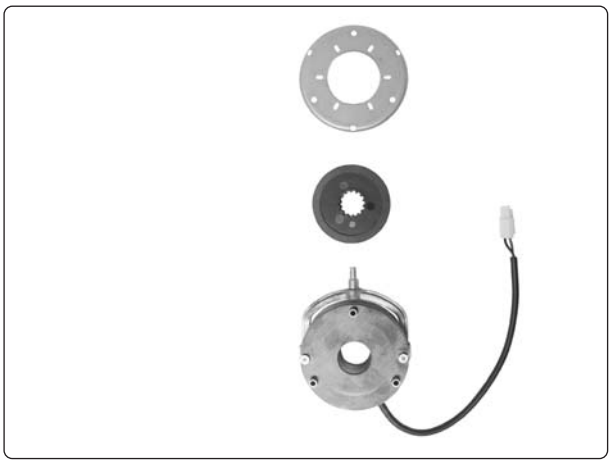


Fig. 20. Magnetic brake, brake disc and cover removed.

3. Fit the cover.

Fig. 21. Magnetic brake, brake disc and cover fitted.

4. Insert a bolt to align the parts. Note the position of the brake release arm, fit the brake so that it is aligned with the motor's cable mounting. Secure the magnetic brake using the three bolts.

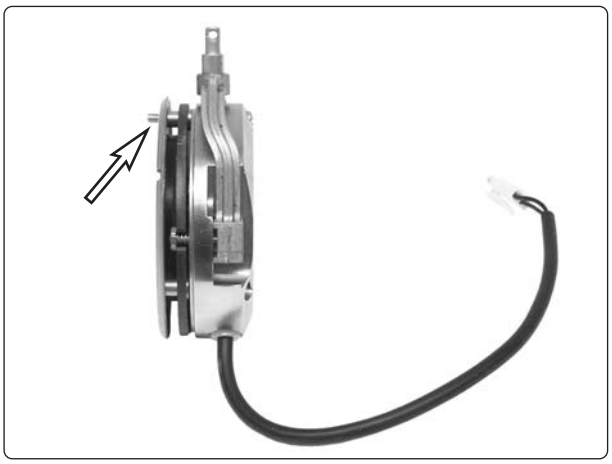


Fig. 22. Align the parts with one another using one of the fixing bolts.

5. Connect the magnetic brake electrical connector, see fig. 23.

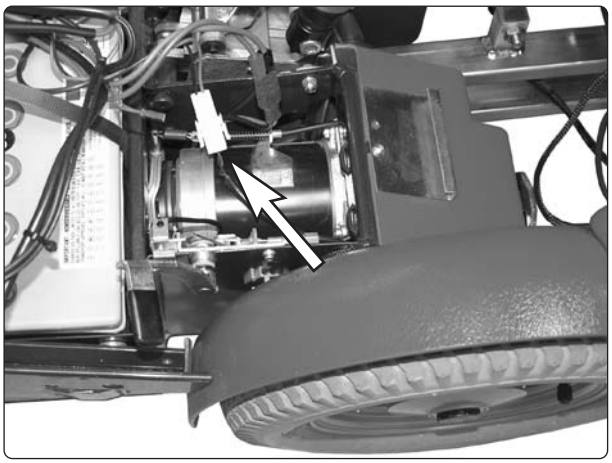


Fig. 23. Magnetic brake electrical connector.

6. Install the brake release cable, see fig. 24.

7. Install the batteries, see page 9.

8. Install the covers, see page 8.

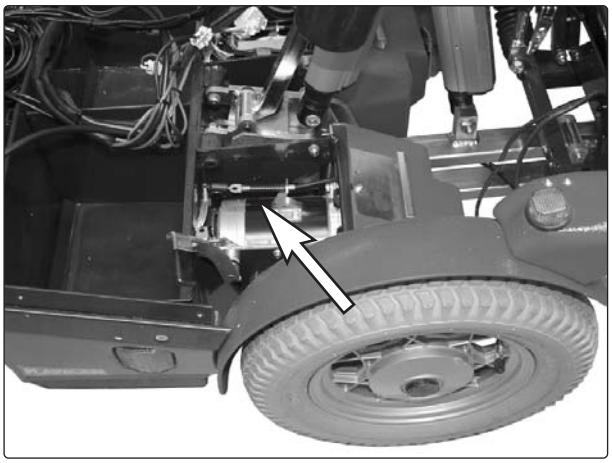


Fig. 24. Magnetic brake release cable.

Drive motor

Removal

1. Raise the seat to its highest position, see page 7.
2. Switch off the power using the control panel.
3. Put the circuit breaker in the “OFF” position, see fig. 25.
4. Remove all covers, see page 8.
5. Remove the wheel, see page 10.

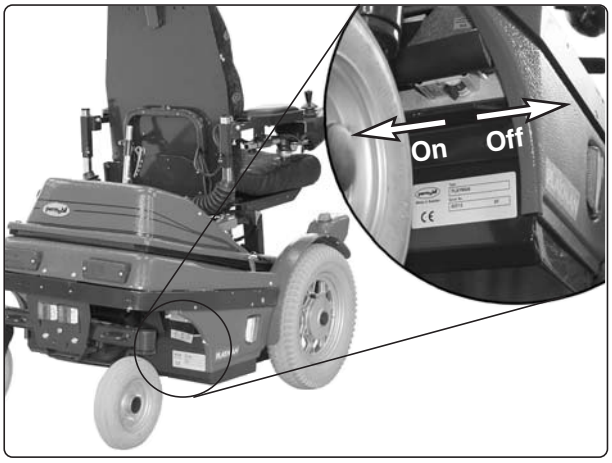


Fig. 25. Main fuse/Battery isolator.

6. Disconnect the electrical connectors to the motor and magnetic brake, see fig. 26.

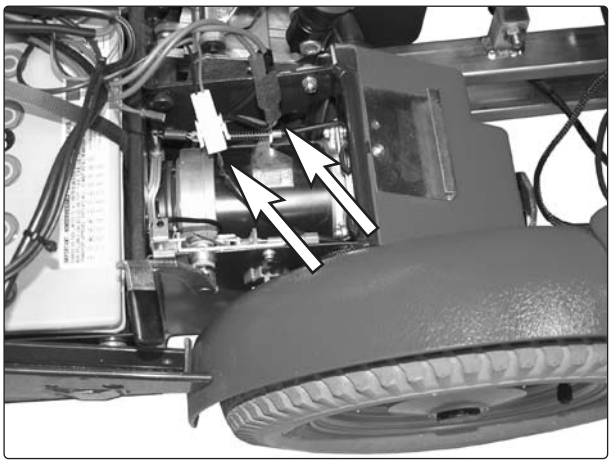


Fig. 26. Electrical connections for magnetic brake.

7. Pull the cable sleeve forwards and take the cable out through the slot in the cable mounting. Unhook the brake release cable from the magnetic brake, see fig. 27.

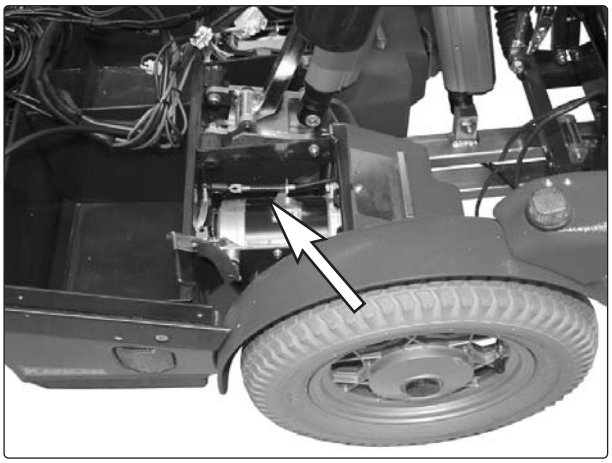


Fig. 27. Release cable for magnetic brake.

8. In order to be able to take the drive motor out, the chassis reinforcement on the side concerned must be detached. The reinforcement is attached with two screws. In order to gain access to the nut on the lower screw, the plastic cover located between the reinforcements can be taken out.

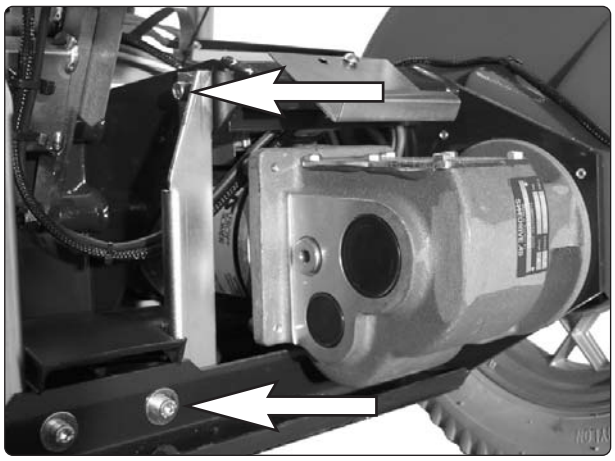


Fig. 28. Fastening screws for the chassis reinforcement.

9. Unscrew the three screws holding the motor.

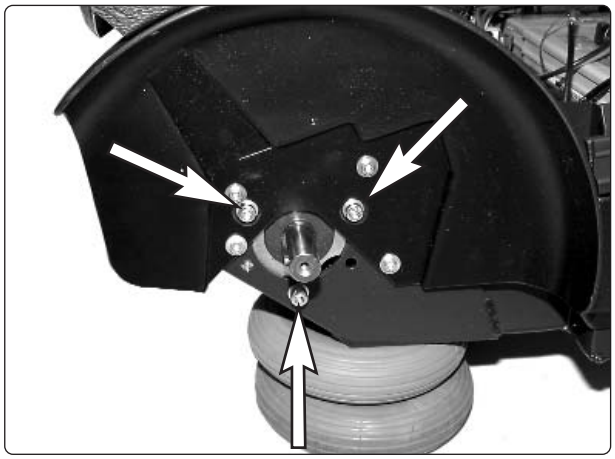


Fig. 29. Drive motor fastenings.

10. Turn the motor sideways so that the drive shaft moves freely. Then pull the motor straight out.

NOTE! In order to facilitate its extraction, push the battery as far back as possible.

Installation

Mounting is performed in the reverse order.

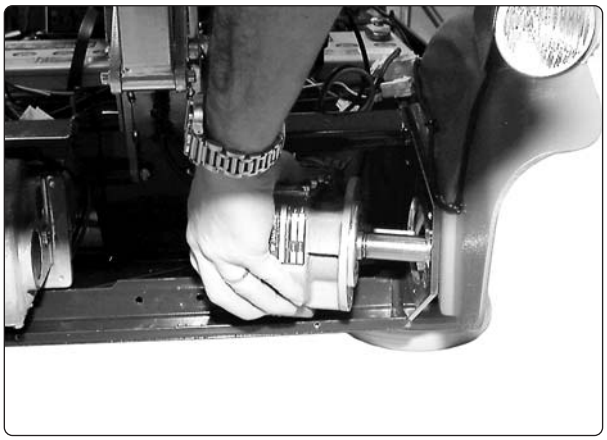


Fig. 30. Removal of drive motor.

Seat lift actuator

The working procedure is the same for both of the seat lift's actuators.

NOTE! However, the work for the left actuator can be made easier if the seat is pushed forward manually. Make sure when doing so that no cables are stretched too tightly.

Removal

1. Run the seat lift up to its uppermost position before releasing the seat lift, see page 7.
2. Detach the seat lift and chassis covers, see page 7. Run the seat lift back down again.
3. Switch off the power using the control panel.
4. Put the circuit breaker in the "OFF" position, see page. 20.
5. Cut away the wiring bundle ties fastening the wiring for the actuator.
6. Loosen the wiring connections to the actuator's motor, see fig. 31. Note the placement of the cables with an eye towards their future remounting.
7. Unscrew and remove the two screws holding the actuator, see fig. 32.

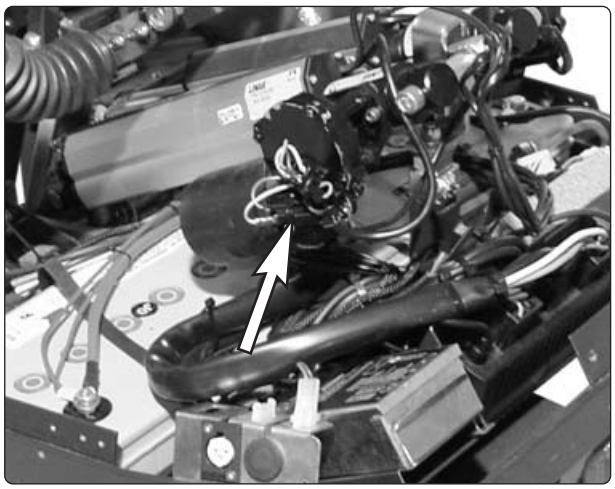


Fig. 31. Cable connections for the actuator.

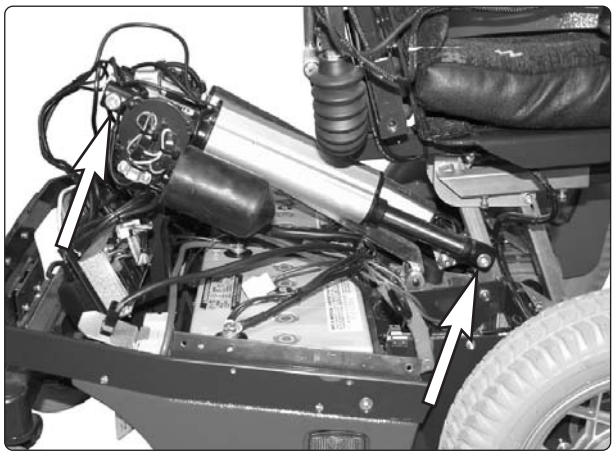


Fig. 32. The actuator's base.

8. Unscrew and remove the screw holding the clamping ring for the limit switch rod. Open the clamping ring and detach it from the actuator, see fig. 33:1.
9. Loosen the screws holding the limit switch kit, see fig. 33:2-3.
10. Draw the actuator out.

Installation

Mounting is performed in the reverse order.

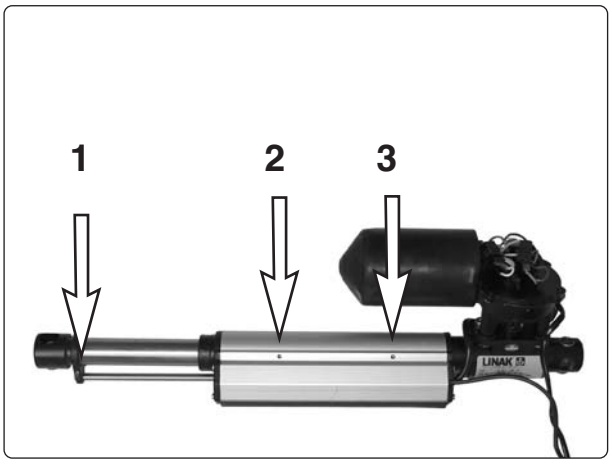


Fig. 33. Limit switch kit fastening points

Pilot+ Power Module

Removal

1. Raise the seat to its highest position, see page 7.
2. Switch off the power using the control panel.
3. Put the circuit breaker in the “OFF” position, see page 20.
4. Remove the seat lift and chassis covers, see page 8.
5. Loosen the two screws used to mount the power module, see fig. 34:2.
6. Lift the power module up.
7. Loosen the electrical connections to the power module. Pay attention to the placement of the contacts with an eye towards later remounting, see fig. 35.

Fitting

Mounting is performed in the reverse order.

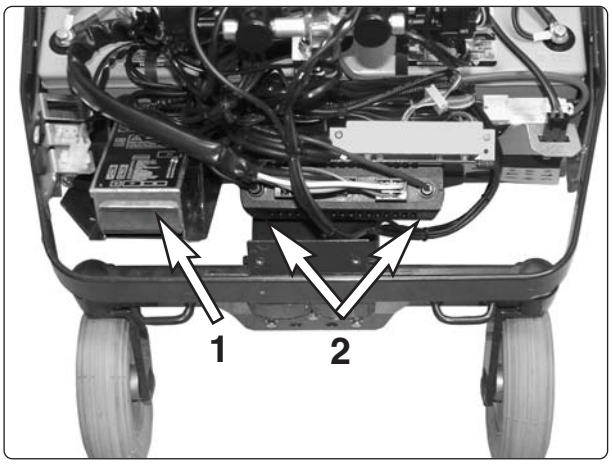


Fig. 34. SLS driver sits loosely in its holder. Power Pilot+ fastened with two screws.

SLS Drive stage

Removal

1. Raise the seat to its highest position, see page 7.
2. Switch off the power using the control panel.
3. Put the circuit breaker in the “OFF” position, see page 20.
4. Remove the seat lift and chassis covers, see page 8.
5. Lift up the SLS box, which is sitting loose in its holder, see fig. 34:1.
6. Pull the cover off the box.
7. Cut away the wiring bundle tie holding the cables and loosen the electrical connections. Pay attention to the placement of the contacts with an eye towards later remounting.
8. Detach the circuit board from the case by loosening the two fastening screws in the middle of the card. Fixings in the form of plastic clips can also occur.

Installation

Mounting is performed in the reverse order. Refer to the diagram on the cover of the SLS box for connections.

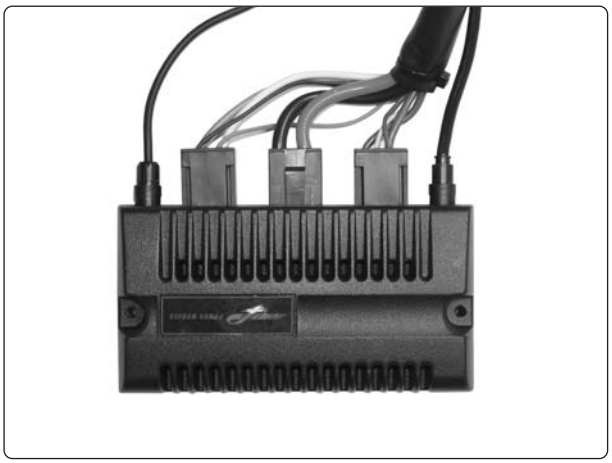


Fig. 35. Electrical connections for the Power Pilot+.

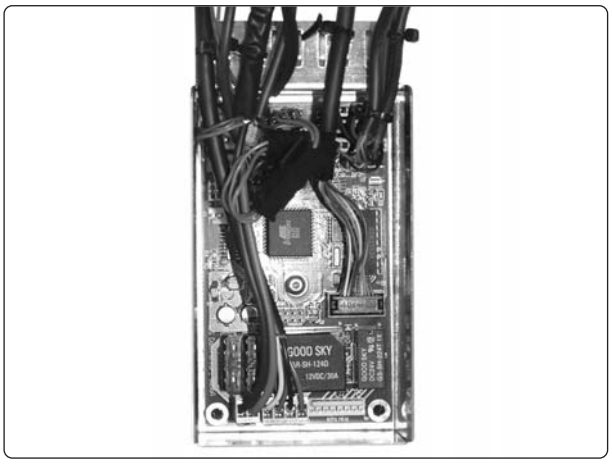


Fig. 36. Electrical connections for the SLS Driver.

Control panel

Removal

1. Put the circuit breaker in the “OFF” position, see page 20.
2. Disconnect the control panel cable by pulling the connector at the rear of the control panel straight outwards.
3. To remove the control panel, remove the screws holding the common bracket for the control panel and Seat control panel, see fig. 37. Remove the control panel bracket by removing the two screws on the rear of the control panel, see fig. 38.

Installation

Installation is the reverse procedure.

Fig. 37. The Control panel and Seat control panel bracket.

Seat control panel

Removal

1. Remove the cover of the Seat control panel by pulling it straight upwards. If the lid is stuck, you can carefully use a screwdriver to pry between the lid and the lower part of the end of the box, see fig, 39.
2. You can now lift the circuit board and cable out of the box.
3. Disconnect the cable from the circuit board by pulling the connector straight upwards, see fig. 40.
4. To remove the seat control panel, remove the screws holding the common bracket for the seat control panel and Seat control panel, see fig. 37. Remove the seat control panel bracket by removing the two screws on the underside of the box, see fig. 38. Note the position of the bracket for refitting.

Installation

Installation is the reverse procedure.

Fig. 38. The Control panel and Seat control panel fixings.

Fig. 39. Removing the Seat control panel lid.

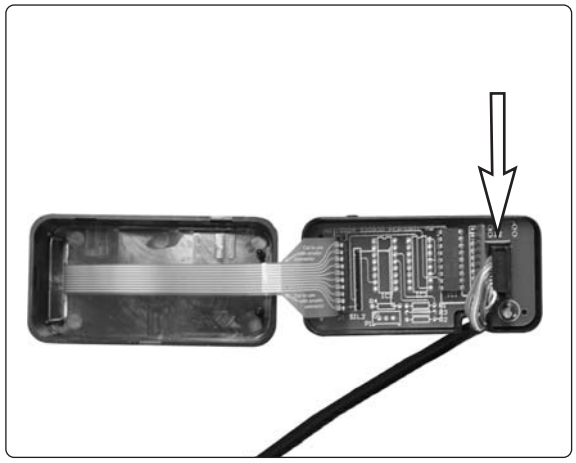


Fig. 40. The Seat control panel electrical connector.

Circuit breaker and fuses

Resetting the circuit breaker

The circuit breaker also acts as a battery isolator, but is usually referred to as the circuit breaker.

You will not normally need to change the circuit breaker, as you can reset it when it has tripped. It is located on the underside of the chassis, over the right rear wheel, see fig. 41. The circuit breaker is protected from dirt and water by a rubber lip, which can easily be folded back.

NB! A tripped circuit breaker often means that there is a serious electrical fault. Check the cause thoroughly before you reset the circuit breaker.

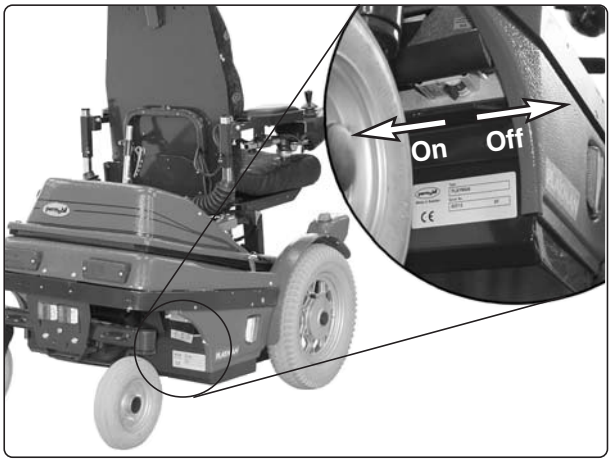


Fig. 41. Circuit breaker/Battery isolator.

Changing the circuit breaker

1. Detach the seat lift and chassis covers, see page 8.
2. Switch off the power using the control panel.
3. Put the circuit breaker in the “OFF” position, see fig. 41.
4. Disconnect the battery positive lead, which is between the battery and the circuit breaker.
5. Remove the circuit breaker by removing the two screws, see fig. 42.

NB! Note the orientation of the circuit breaker. The ON/OFF positions must agree with the label.

6. Disconnect the cables from the circuit breaker by loosening the screws, see fig. 43.
7. Connect the cables to the new circuit breaker. Put the circuit breaker in the “OFF” position.

NB! Check that the cables are fully secure.

8. Attach the new circuit breaker with the two screws, see fig. 42.

NB! Check the orientation of the circuit breaker. The ON/OFF positions must agree with the label.

9. Reconnect the battery positive lead.
10. Mount the seat lift and chassis covers, see page 8.
11. Put the circuit breaker in the “ON” position, see fig. 46.

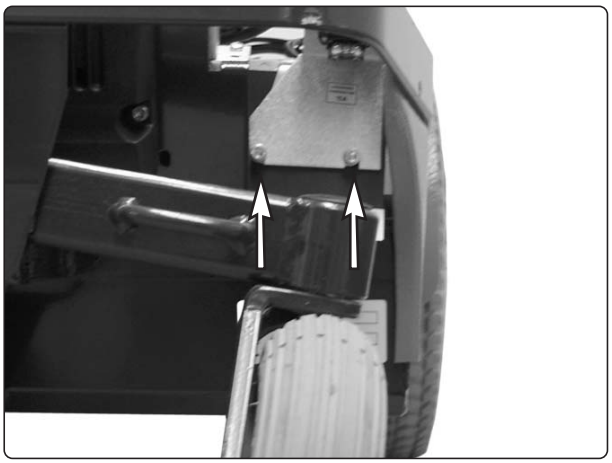


Fig. 42. Circuit breaker mounts.

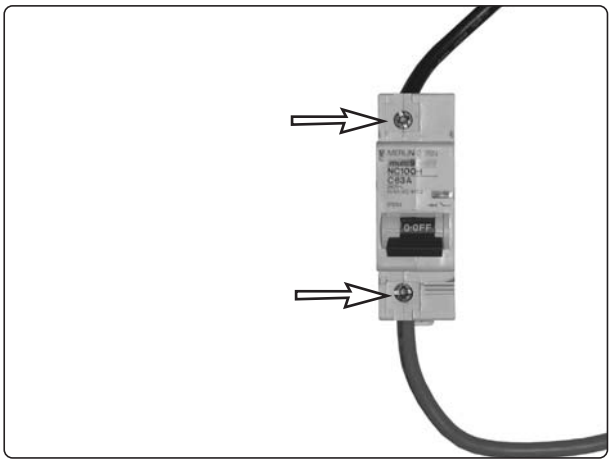


Fig. 43. Circuit breaker electrical connections.

Changing the charge fuse

The charge fuse is on the underside of the chassis, over the right rear wheel, next to the circuit breaker, see fig. 49. Switch off the main circuit breaker and the charger, if in use, before you change the charge fuse.

NB! The circuit breaker must be in the “ON” position during charging.

Fig. 44. Charge fuse

Changing the seat/lights fuse

There are two fuses in the SLS drive stage, F1 (24V unswitched) and F2 (24V switched). These protect two outlets, located to the left of the SLS drive stage, next to the charge socket. One of the outlets (24V unswitched) supplies power regardless of whether the chair is switched on or off. The other outlet (24V switched) supplies power only when the chair is switched on. The seat and lights are normally connected to this outlet.

1. Detach the seat lift and chassis covers, see page 8.
2. Switch off the power using the control panel.
3. Set the main fuse to the “OFF” position, see page 20.
4. Lift up the SLS box, which is sitting loose in its holder, see fig. 45.
5. Pull the cover off the SLS box.
6. Replace broken fuses, see Fig. 46
7. Put the cover back on the box.
8. Put the SLS box back into its place on the chassis.
9. Remount the covers.
10. Put the circuit breaker in the “ON” position, see page 20.

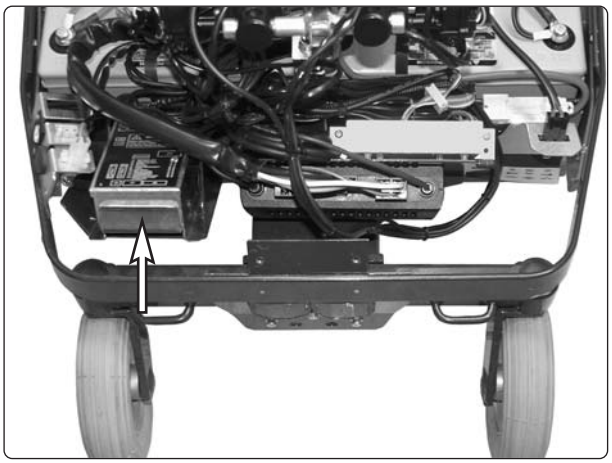


Fig. 45. SLS driver sits loosely in its holder.

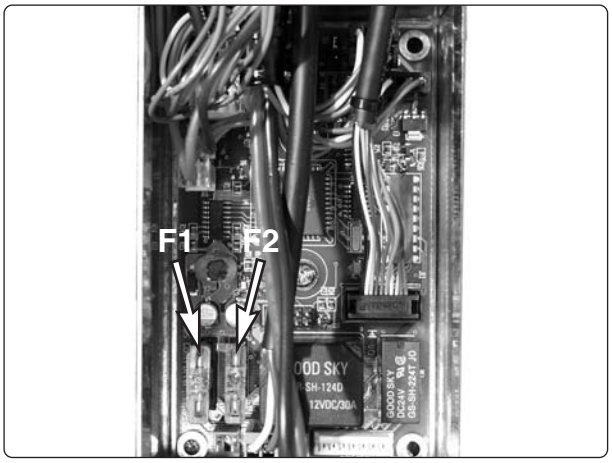


Fig. 46. F1 = 24V unswitched 15A.
F2 = 24V switched 15A Seat/Lights.

Brake release sensor

Removal

1. Detach the seat lift and chassis covers, see page 8.
2. Switch off the power using the control panel.
3. Set the main fuse to the “OFF” position, see page 20.
4. Detach the brake release sensor’s base by loosening the two screws, see fig. 47.
5. Separate the connector in the connection cable.

Installation

Installation is the reverse procedure.

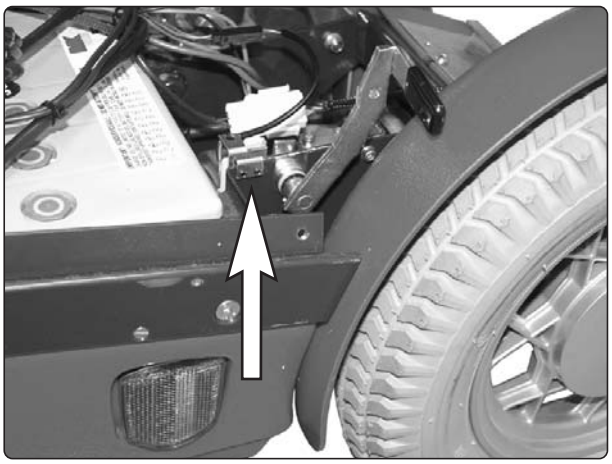


Fig. 47. Brake release sensor

Seat electronics

Actuator Control Board

Removal

1. Detach the seat lift and chassis covers, see page 8.
2. Switch off the power using the control panel.
3. Set the main fuse to the “OFF” position, see page 20.
4. Detach the case and the actuator control board by unscrewing and removing the two screws, see fig. 48.

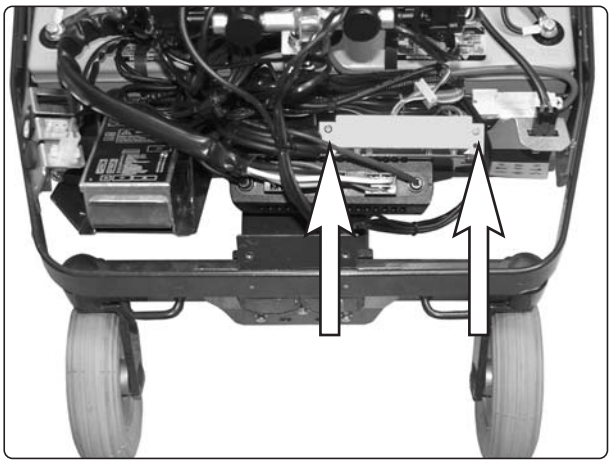


Fig. 48. Detachment of Actuator control board

5. Loosen all cable connections sitting on the card. Take careful note of the placement of the cables with an eye towards their future remounting.

Installation

Installation is performed in the reverse order.

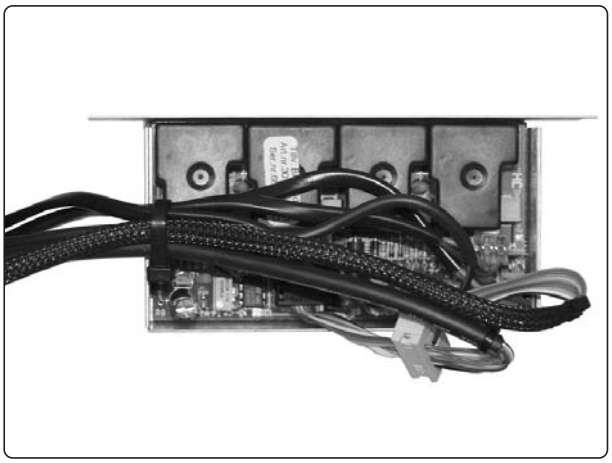


Fig. 49. Detached Actuator control board.

Trouble Shooting

Battery voltage indicator

The battery voltage indicator shows the status of the wheelchair.

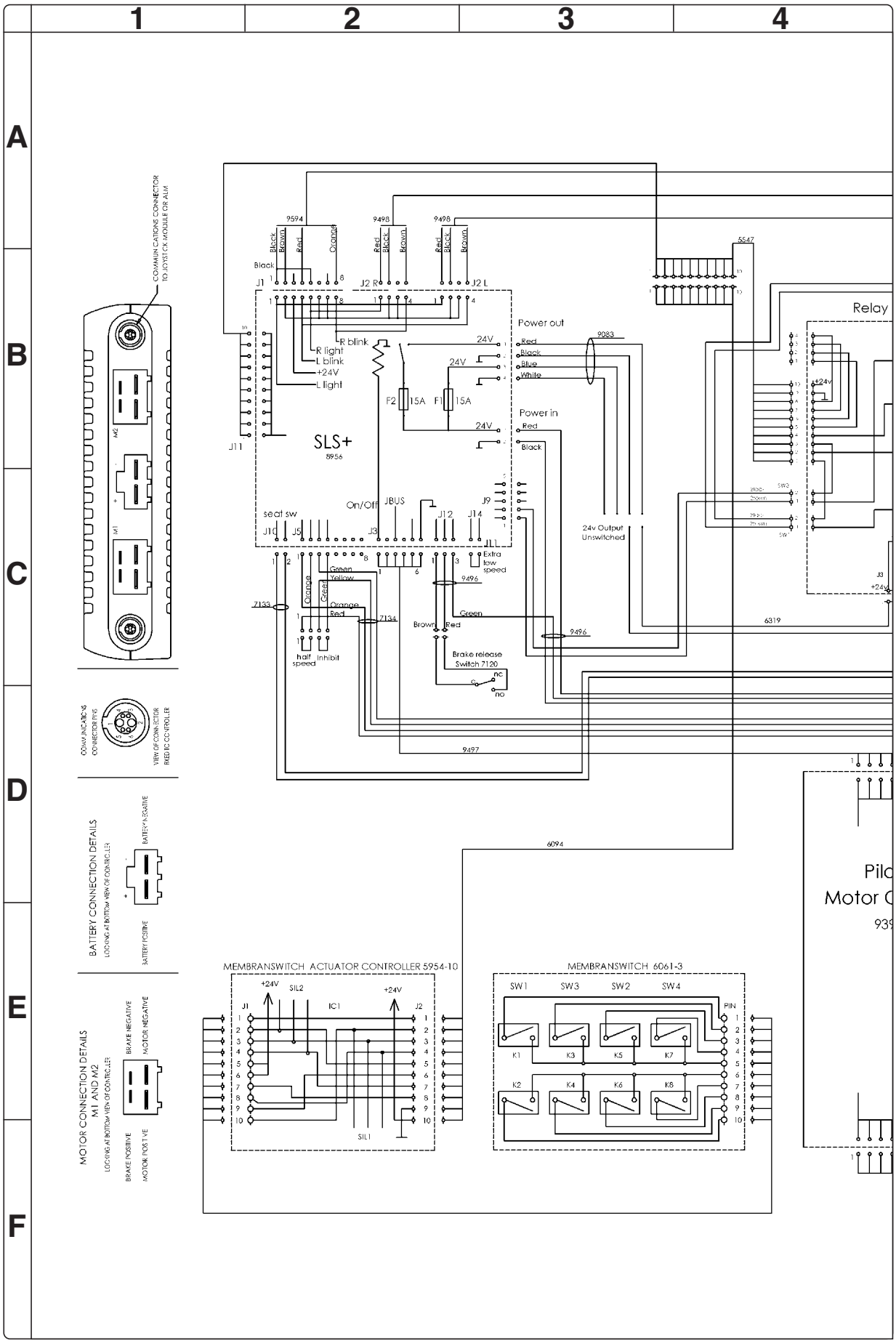
Steady Display - Everything is working correctly.
Flashing slowly - The batteries need to be charged.
Flashing quickly - Fault signal. A fault has occurred and the wheelchair can not be driven.

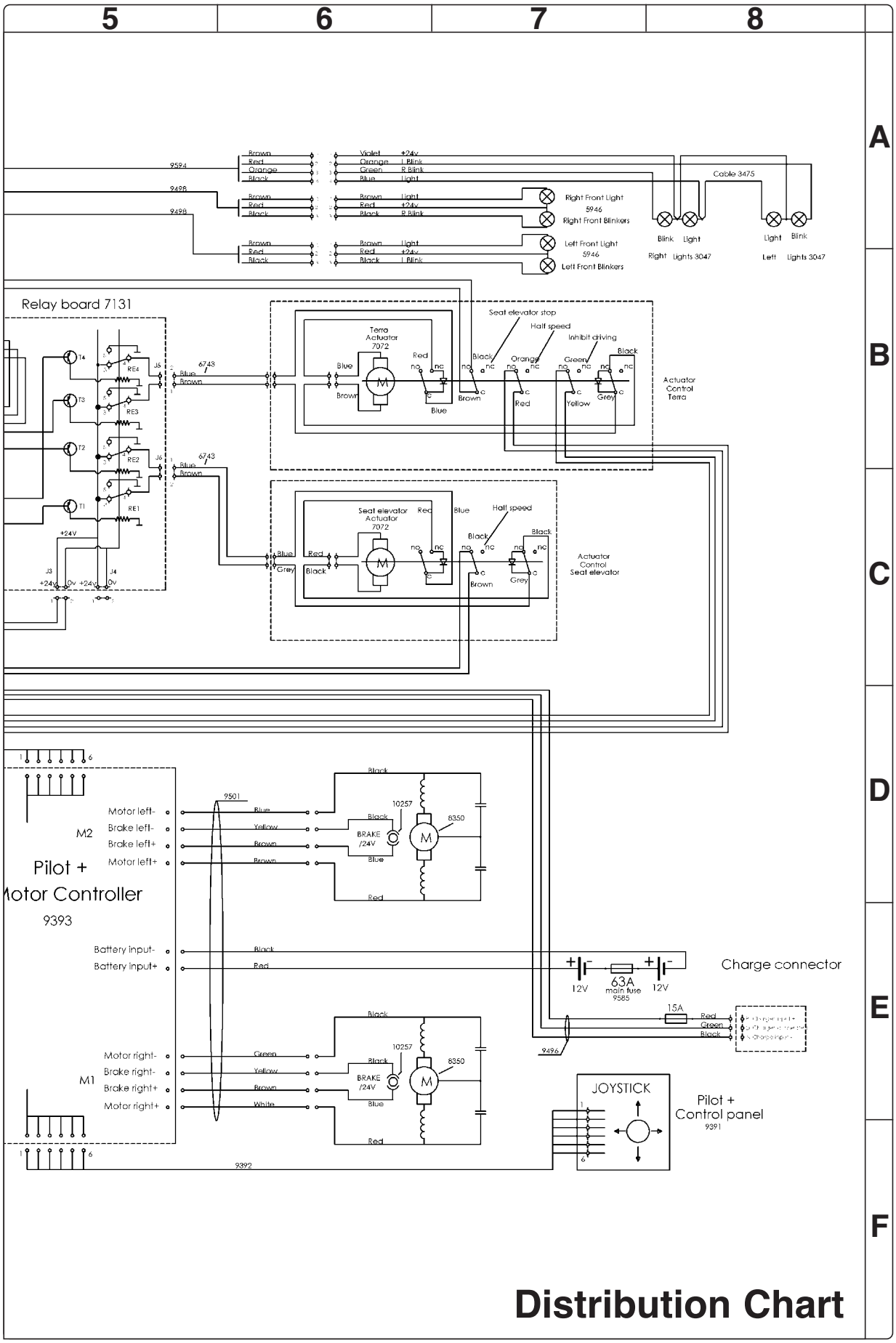
Fault signals

The number of flashing lights indicates the fault.

– Note the number of flashing lights.
– Switch off the chair.
– Switch the chair back on.
– If the fault is still there, count the number of flashing lights, then look up the possible cause and action in the table below.

CAUSE	LEDs	ACTION
High battery voltage		Check the battery and the connections between the battery and control unit
Break in the brake circuit		Check the connections to the magnetic brake.
Fault in the electronics		Check the connections to the power module If the fault persists, change the power module
Fault in the control panel		Make sure the joystick isn't actuated at switch-on, change the control panel.
Short circuit, right drive motor		Check the motor connections and cable.
Open circuit, right drive motor		Check the connection to the right drive motor.
Short circuit, left drive motor		Check the motor connections and cable.
Open circuit, left drive motor		Check the connection to the left drive motor.
Low battery voltage		Check the condition of the battery. Check the connection between the battery and the control unit.


1
2
3
4
A
B
C
D
E
F
COMMUNICATIONS CONNECTOR TO JOYSTICK MODULE OR ALM
M2
M1
COMMUNICATIONS CONNECTOR PINS
VIEW OF CONNECTOR WIRED TO CONTROLLER
BATTERY CONNECTION DETAILS
LOOKING AT BOTTOM VIEW OF CONTROLLER
BATTERY NEGATIVE
BATTERY POSITIVE
MOTOR CONNECTION DETAILS M1 AND M2
LOOKING AT BOTTOM VIEW OF CONTROLLER
BRAKE NEGATIVE
MOTOR NEGATIVE
BRAKE POSITIVE
MOTOR POSITIVE
9594
9498
9498
Black
Brown
Red
Orange
Red
Black
Brown
Red
Black
Brown
J1
J2 R
J2 L
5547
Relay
Power out
Red
Black
Blue
White
9083
R blink
R light
L blink
+24V
L light
24V
24V
24V
F2
15A
F1
15A
Power in
Red
Black
J11
SLS+
8956
On/Off
JBUS
J9
seat sw
J10
J5
J3
J12
J14
J13
Extra low speed
24v Output Unswitched
+24v
J3
+24v
Green
Yellow
9496
Z133
Orange
Green
Orange
Red
Z134
Brown
Red
Green
9496
6319
half speed
Inhibit
Brake release Switch 7120
nc
no
9497
6094
MEMBRANSWITCH ACTUATOR CONTROLLER 5954-10
+24V
SIL2
IC1
+24V
J1
J2
SIL1
MEMBRANSWITCH 6061-3
SW1
SW3
SW2
SW4
PIN
K1
K3
K5
K7
K2
K4
K6
K8
Pilo
Motor C
939


5
6
7
8
A
B
C
D
E
F
Relay board 7131
Terra Actuator 7072
Seat elevator Actuator 7072
Seat elevator stop
Half speed
Inhibit driving
Actuator Control Terra
Actuator Control Seat elevator
Right Front Light 5946
Right Front Blinkers
Left Front Light 5946
Left Front Blinkers
Cable 3475
Blink Light Right Lights 3047
Light Blink Left Lights 3047
Pilot + Motor Controller 9393
M2
M1
Motor left-
Brake left-
Brake left+
Motor left+
Motor right-
Brake right-
Brake right+
Motor right+
Battery input-
Battery input+
BRAKE /24V
10257
8350
12V
63A main fuse 9585
15A
Charge connector
JOYSTICK
Pilot + Control panel 9391
9392
9393
9496
9498
9501
Distribution Chart

Order no: 201162-US-0